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Morpholes neurons compromise the development of cortical connectivity

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Abstract

It is currently accepted that cortical maps are dynamic constructions that are altered in response to external input. Experience-dependent structural changes in cortical microcircuits lead to changes of activity, i.e., changes in information encoded. Specific patterns of external stimulation can lead to creation of new synaptic connections between neurons. The calcium influxes controlled by neuronal activity regulate the processes of neurotrophic factors released by neurons, growth cones movement and synapse differentiation in developing neural systems. We propose a model for description and investigation of the activity dependent development of neural networks. The dynamics of the network parameters (activity, diffusion of axon guidance chemicals, growth cone position) is described by a closed set of differential equations. The model presented here describes the development of neural networks under the assumption of activity dependent axon guidance molecules. Numerical simulation shows that morpholess neurons compromise the development of cortical connectivity. © 2009 Imperial College Press.

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Keywords

Axon guidance, Network growth, Structural plasticity